CHAPTER I

# Introduction

WITH the emergence of the persistent and increasing problem of antibiotic-resistant staphylococcal infections of operative wounds, a definitive study to test a specific means of preventing those infections was considered.

Although the use of ultraviolet radiation in the operating room has been enthusiastically recommended by some investigators, it has met with a notable lack of widespread acceptance. One can, of course, only speculate on the reasons. Perhaps the advent of World War II, disrupting many hospital staffs at a time when much of the work with ultraviolet radiation was being reported, contributed to this indifferent response, and the inconvenience of the protective equipment—headgear, eyeshade, and goggles—certainly was a deterrent to many surgeons. Most probably, however, the introduction of sulfonamides in 1936, penicillin in 1941, and the numerous antibiotics in the 1950's lulled many surgeons into the false belief that wound infection was a vanishing problem. It has been frequently suggested (Altemeier *et al.*, 1955; Howe, 1956; Pulaski and Bowers, 1957) that, as antibiotics became available and began to be used prophylactically as well as therapeutically, surgical interest in the fine details of aseptic technic waned. Hart (1960) described this attitude as follows: ". . . members of our profession chose to accept the heavy seeding with viable pathogenic bacteria sedimenting from the contaminated air and then to attempt to control them by the newly-introduced 'miracle drugs' rather than to kill the bacteria in the air before they entered the wound. . . . Most members of the profession consulted at that time did not consider the air to be an important route of bacterial spread, doubted the value of ultraviolet irradiation in the operating room, and considered it at least a nuisance requiring for the personnel protection which might be mildly annoying and at the most a handicap in operating and a hazard to themselves, the personnel and the patient; they believed, furthermore, that with the new chemicals and antibiotics available to control infection such precautions were unnecessary."

Although antibiotic-resistant strains of pathogenic bacteria were recognized early in the antibiotic era, it was not until the mid-1950's that the problem received widespread recognition. Altemeier *et al.* (1955), Howe (1956), McKittrick and Wheelock (1954), and others called attention to the narrow limits of the prophylactic benefits of antibiotics in surgery, to the magnitude of the still unsolved problem of surgical wound infection, and to the necessity of returning to a rigidly aseptic technic during operations. It was in that climate of thought that the present cooperative study was conceived, to examine in a controlled clinical investigation the effects of direct ultraviolet radiation on the incidence of operative wound infection.

Based on the recommendation of the Committee on Trauma of the National Research Council that ultraviolet irradiation be evaluated, investigators met at the National Academy of Sciences on September 19, 1958. The basic decision made by this group was that the study should evaluate the question, Is direct ultraviolet irradiation of the operating room a practical adjunct in preventing infections in those

operative wounds which are normally considered free of bacterial contamination? In addition, it was decided to gather as much information as practical, and in the shortest time feasible, regarding the background of the patients, the nature of the operations, and the various types of wound infections. A cooperative approach was selected as the optimal investigative pattern with randomization of ultraviolet and control conditions, and observations utilizing the double-blind principle.

The cooperating institutions were the University of California at Los Angeles, the University of Cincinnati, the George Washington University, Hahnemann Medical College, and the University of Pennsylvania. A total of 16 operating rooms at the five institutions were chosen. Data from each hospital were to be forwarded to the Follow-up Agency of the National Research Council for compilation and statistical analysis. Ultraviolet lamps and installation designs were to be provided by Westinghouse Electric Corporation.

Although our primary objective has been an evaluation of ultraviolet radiation, secondary benefits accrue from such a study, especially information on the incidence of wound infection in relation to specific operative procedures and other factors in various hospitals across the nation. Studies of this type are of tremendous potential value in view of the millions of dollars lost annually through loss of life, prolonged hospitalization, predisposition to subsequent complications (such as wound hernia), and time lost from work.